

What Is Claimed Is:

1. In a direct injection type internal combustion engine in which a fuel is injected directly into a cylinder, in
5 said cylinder a tumble flow of air is formed and a rich air-fuel mixture is gathered and a stratification operation is carried out, said direct injection type internal combustion engine wherein
 - an opening and closing valve for shutting off an
 - 10 intake air passage for supplying said air into said cylinder and a bypass passage for bypassing said opening and closing valve and having a cross-section smaller than a cross-section of said intake air passage; and
 - an outlet of said bypass passage is opened near to an
 - 15 intake valve of an outlet portion of said cylinder.
2. A direct injection type internal combustion engine according to claim 1, wherein
 - an outlet portion of said air said bypass passage is
 - 20 opened near to center of said cylinder in a side of an ignition plug of said intake valve.
3. A direct injection type internal combustion engine according to claim 1 or claim 2, wherein

said opening and closing valve is a rotary valve having three positions comprising a full closing, a middle opening, and a full opening.

5 4. A direct injection type internal combustion engine according to claim 1 or claim 2, wherein

said opening and closing valve is a combination of two semi-circular shape valves.

10 5. In an internal combustion engine having a partition wall which partitions an intake air passage for introducing air into a cylinder in an upper stage and a lower stage, wherein

15 said partition wall is constituted of a bimetal, and a valve for closing a lower side passage of said intake air passage during a low temperature time of said engine is provided,

20 said bimetal partition wall is constituted to deform to a position in which said bimetal partition wall makes narrow an upper side passage.

6. In a direct injection type internal combustion engine in which a fuel is injected directly into a cylinder,

25 said direct injection type internal combustion engine comprising:

an intake valve for introducing air into a cylinder and provided in an outlet of said cylinder, an electromagnetic solenoid mechanism for controlling an opening and closing said intake valve, a device for forming 5 a tumble flow of said air into said cylinder by gathering a rich air-fuel mixture in a vicinity of an ignition plug, a opening and closing valve for shutting off an intake air passage, and a bypass passage for bypassing said opening and closing valve and having a cross-section smaller than a 10 cross-section of said intake air passage, and an outlet of said air of said bypass passage is opened near to said intake valve.

7. A direct injection type internal combustion engine 15 comprising:

an electromagnetic type variable valve mechanism in which an opening and closing timing of an intake valve and an exhaust valve is enable to control regardless to a rotation number;

20 an opening and closing valve for shutting off an intake air passage for introducing air into a cylinder, cylinder; and

a communication passage for communicating said intake air passage of adjacent cylinders;

thereby an intake stroke time of one cylinder, compression air of said adjacent cylinders is flown through one of said communication passages.

5 8. A direct injection type internal combustion engine according to claim 7, wherein
during a starting time a specific cylinder is burned.

9. A control method of an intake air passage of an
10 internal combustion engine, wherein
during said starting time, supplying said air into a cylinder through an intake valve from an intake air passage having a small cross-section; and
generating a tumble flow into said cylinder; and
15 after a warming-up of said engine, increasing said cross-section area of said intake air passage than a cross-section area of said starting time.

10. An air supply method of an internal combustion
20 engine, wherein
during a starting time, supplying said air into a cylinder through an intake valve from a first intake air passage having a small cross-section area;
generating a tumble flow into said cylinder;
25 after a warming-up of said engine, supplying said air into said cylinder through an intake valve from a main

intake air passage which is divided into an upper stage and a lower stage; and

in a stratification operation region, generating said tumble flow into said cylinder by closing a lower side
5 passage of said main intake air passage.

11. A direct injection type internal combustion engine comprising:

a fuel injector for injecting directly a fuel into a
10 combustion chamber;

an ignition coil for igniting an air-fuel mixture of said combustion chamber; and

an air-fuel mixture induction device for forming an air-fuel mixture region which enable to easily spark at a
15 vicinity of said ignition plug during a starting of said internal combustion engine.

12. A direct injection type internal combustion engine according to claim 11, wherein

20 said air-fuel mixture induction device comprises a tumble air supply device for forming a tumble air flow in said combustion chamber.

13. A direct injection type internal combustion engine
25 according to claim 11, wherein

said air-fuel mixture induction device comprises a narrow conduit passage provided adjacently side by side to a main intake air passage and a change-over valve provided in a branch portion between said conduit passage and said 5 main intake air passage.

14. A direct injection type internal combustion engine,

wherein

an air and fuel mixture induction device for inducing 10 a mixture of an air and a fuel in a surrounding portion of an ignition plug in a cylinder by operating immediately after an operation of a starting switch of said internal combustion engine is provided; and

said air and fuel mixture induction device functions 15 to a cylinder which enters firstly to an intake stroke after at least an operation of said starting switch; and said air and fuel mixture is induced to said surrounding portion of said ignition plug in said cylinder.

20 15. A direct injection type internal combustion engine,

wherein

a bypass passage for supplying an air into a cylinder by bypassing a main intake passage is provided; and when a rotation number of said internal combustion 25 engine is 150-200 rpm, said bypass passage has a passage

diameter in which a pressure in said cylinder during said intake stroke is -100 mmHg degree (88 Pka degree).